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ABSTRACT

This is the final volume of a four-volume report of a research project designed to (1) identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation, (2) develop instructional modules and determine their place in either high school or 2-year college programs, and (3) implement an articulated curriculum with actual programs. This volume contains the scripts to the two films "Preparing for a Career in an Expanding Industry--Agriculture" and "The Muskegon County Wastewater Management System--A System Designed to Treat Domestic and Industrial Waste Now and For the Future." The scripts and accompanying films, developed from the project, are designed to assist educators in providing students with information on the agricultural industry. (SH)

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FINAL REPORT

VOLUME IV OF IV VOLUMES - CAREER AWARENESS INFORMATION

PROJECT NO. VO218VZ
GRANT NO. OEG-O-74-1669

A STUDY OF JOB DEMANDS AND CURRICULUM DEVELOPMENT IN AGRICULTURAL TRAINING RELATED TO THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM

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JANUARY, 1976

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PREFACE

This volume is one of four volumes prepared by staff in the Vocational Education Department, Muskegon Area Intermediate School District, as a part of the research project entitled, "A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System." The project was funded under a contract with the Bureau of Occupational and Adult Education, U.S. Office of Education. The final report consists of the following volumes:

Volume I:	An Overview of the Research Project
Volume II:	Task Analysis Results
Volume III:	Student Terminal Performance Objectives and Instructional Modules
Volume IV:	Career Awareness Information

Citizens in Muskegon County, Michigan were fortunate in the late 1960's to receive federal, state and local dollars for the construction of a 40+ million dollar "demonstration" wastewater treatment system. It was the opinion of many concerned individuals that a wastewater land treatment system would stimulate the Muskegon economy and restore lakes, streams, and rivers to a condition of purity most Americans had almost given up the hope of achieving. The research project grew out of a need to identify the jobs and training needs of individuals desiring to work in wastewater land treatment systems and related agricultural occupations. It was anticipated that hundreds of new agricultural related jobs would emerge in the region as a result of the Muskegon farm irrigation system.

The purposes of this project were: (1) To identify job needs for agricultural occupations which will result from the Muskegon County Wastewater Management System and perform a task analysis on each occupation; (2) To develop instructional modules and determine their place in either high school or two-year college programs; and (3) Implement an articulated curriculum with actual programs and gain approval for funding.

ACKNOWLEDGEMENTS

Since the inception of the project, many persons have made significant contributions to the development of the materials included in the final report. Appreciation is expressed to Jack A. Wilson, Project Officer, Research Branch, Division of Research and Demonstration, Bureau of Occupational and Adult Education, U.S. Office of Education, for his direction during the preparation of this information. Gratitude is also expressed to the many local, state, and national agency representatives and industries who have given invaluable assistance in this project.

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INTRODUCTION

Graduates from many high schools are finding themselves thrust into an increasingly complex, technological society without saleable skills. Various individuals and groups who are concerned with the educational process are beginning to ask pressing questions in regard to these disenchanted graduates. Some are perhaps asking the question, did these graduates have the opportunity to become aware of the many occupations available to them? Were the graduates given the opportunity to explore a variety of occupations? Did these graduates participate in the decision-making process relative to the type of educational program they completed? Were facilities, equipment, and instruction available for relevant training? A list of questions could certainly be extended. It is evident from the previous comments that those primarily responsible for educating people must continue to work toward improving the educational process. Although the profession has performed well over the years in constructively responding to the demands of society, it appears that the demands will increase in the future.

This volume of the final report should assist educators in providing students with information on the AGRICULTURAL INDUSTRY. An objective of the project was to develop student awareness information related to the research study. An explanation of the information prepared follows.

Filmstrip titled, "PREPARING FOR A CAREER IN AN EXPANDING INDUSTRY-AGRICULTURE"

In order to provide students with an awareness of the Agricultural Industry and the many occupations available as a career, the research staff and consultants developed a filmstrip with narration on a cassette tape. In general, the filmstrip includes the following: (a) The purpose of agricultural education programs; (b) The type of education institutions in which one could receive training in agriculture; (c) The type of teaching methods used to prepare students for agricultural careers; (d) The Future Farmers of America youth organization; and (e) A description of several occupations in the Agricultural Industry. Information presented in the filmstrip is shown in the first section of this document.

Filmstrip titled, "THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM - A SYSTEM DESIGNED TO TREAT DOMESTIC AND INDUSTRIAL WASTE NOW AND FOR THE FUTURE"

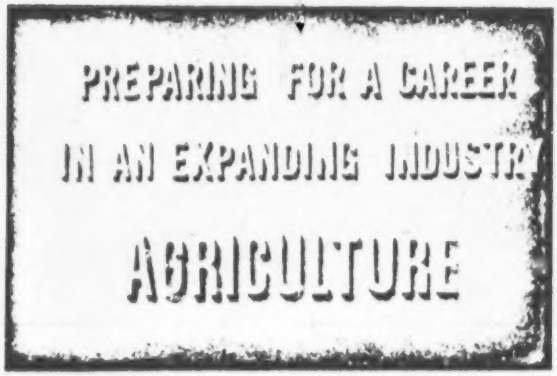
The staff and consultants also produced a filmstrip and a narrative cassette tape centered around Muskegon County's 40+ million dollar wastewater land treatment system. The filmstrip consists of the following: (a) The planning, development, and construction of the project; (b) How the system operates; and (c) A listing of agricultural occupations found in the Muskegon County Wastewater Management System and the duties of individuals working in the identified occupations. This information is depicted in the second section of this volume.

Several individuals provided assistance in developing the two filmstrips and cassette tapes (See Appendix A for listing of persons who provided this assistance).

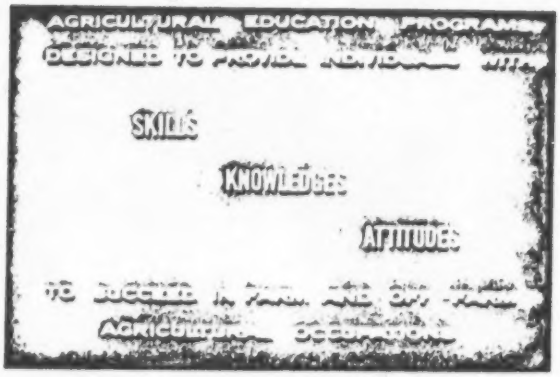
Copies of the two filmstrips and cassette tapes may be acquired by writing to the Superintendent, Muskegon Area Intermediate School District, 630 Harvey Street, Muskegon, Michigan 49442.

"PREPARING FOR A CAREER IN AN EXPANDING
INDUSTRY-AGRICULTURE"

Muskegon Area Intermediate
School District
Muskegon, Michigan
Presents



Preparing For a Career
In an Expanding Industry --
Agriculture



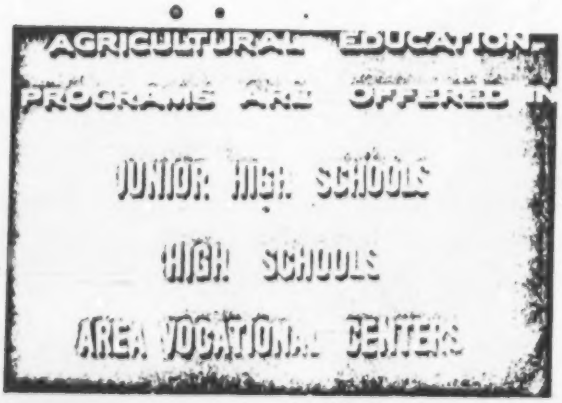
Agricultural Education Programs
Designed to Provide Individuals
with:

Skills

Knowledges

Attitudes

To succeed in farm and off-farm
Agricultural Occupations.



Agricultural Education Programs
Are Offered In:
Junior High School
High School
Area Vocational Centers

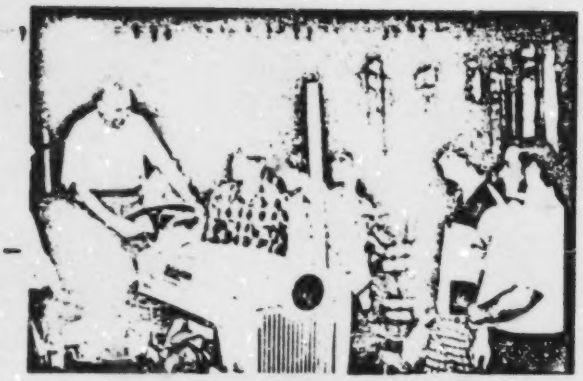
Community College
Technical Institutes
Four Year Colleges
Universities

In your school, interesting and sometimes unusual subjects may be taught by a "Voc. Ag." teacher, the Vocational Agriculture instructor, who can explain the mysteries of how fruits grow, and how insects can spoil what should be good eating.

He can tell you all about seeds. Seeds come in 1,000 or more sizes, shapes, colors, and some are equipped with tiny parachutes of snowy down to carry them far off. Your Voc. Ag. instructor can explain how and when seeds should be planted to achieve the best harvest.

Of course girls can drive tractors. This girl may never live on a farm, but she'll know how to operate large equipment and small yard tractors. Farm machinery holds no secrets or fears when one has had proper instruction.

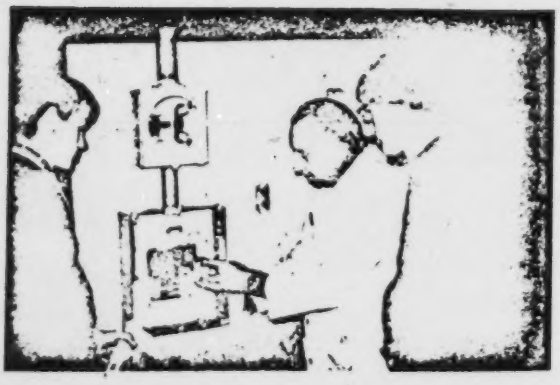
5



Tractors, and all large farm equipment are meant to be handled in a safe and efficient manner. Students are taught to respect the enormous power of these and other machines used in all agricultural activities, on and off the farm.

There are many different types of farm tractors and it is important to receive instruction in operating several types of tractors.

Agricultural education means a lot of testing and experimenting, too. These students are learning about a new method of planting corn without preparing the ground in the usual manner.



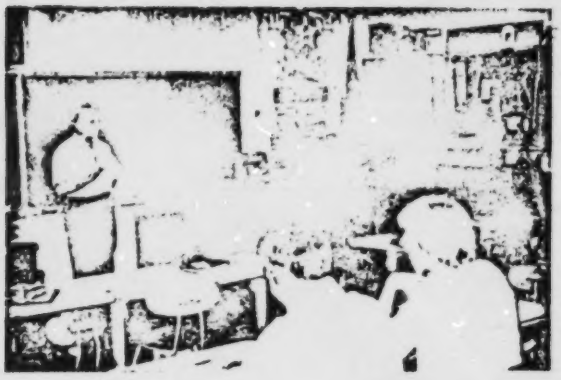
Fundamentals of electrical installations are taught in Voc. Ag. classes. Many students finish school and become electricians after additional training. Such knowledge and skills are also useful around the home.

Students studying in agricultural education programs can receive additional training by working in a local business.

Many local meat processing plants are most helpful in providing such work experience. For a student interested in becoming a highly skilled and licensed meat inspector, this is the place to learn.

Patient and knowledgeable experts explain the great care required in meat processing and the need to protect every consumer.

These students are learning the fundamentals of erecting a roof. They may also have a class project to put into practice what they learned in the classroom.



In agricultural education classes the discussion between teacher and student is a continuous process used to solve problems.

The class moves out of the classroom for a practical demonstration and actual experience.

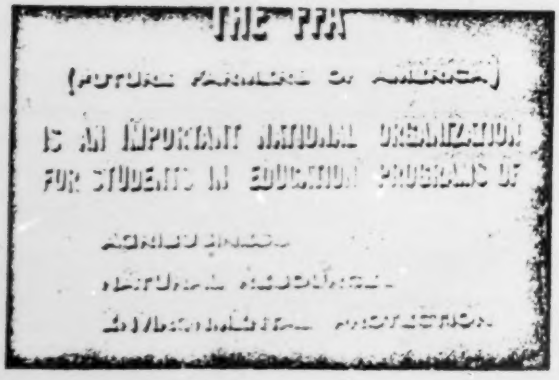
Pruning of ornamental fruit trees must be done with perfection and skill to achieve shape and beauty. Such practical experience prepares one for the real world of work, or just knowing how to make ornamental trees grow their best.

Some beekeeping and honey production information can be taught in a classroom. The Voc. Ag. Teacher is explaining how the bees deposit their honey.

The students are learning that the honey is extracted in August and September. Some 60 pounds of honey must be left in each hive for the bees to feed on during the winter months.

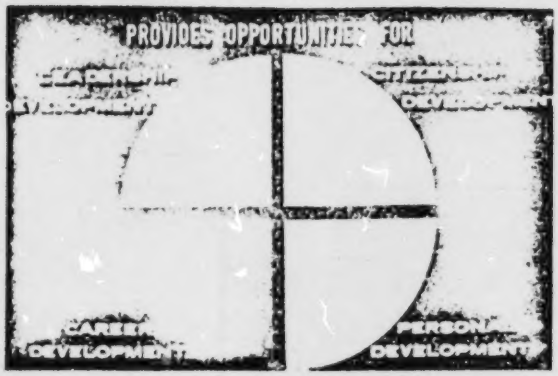
This former student became interested in beekeeping while in high school. He now operates a thriving honey production plant and rents his bee hives for pollination during the fruit blossoming season.

Are you familiar with the FFA organization? In the next several frames we are going to explain to you what the FFA is all about.



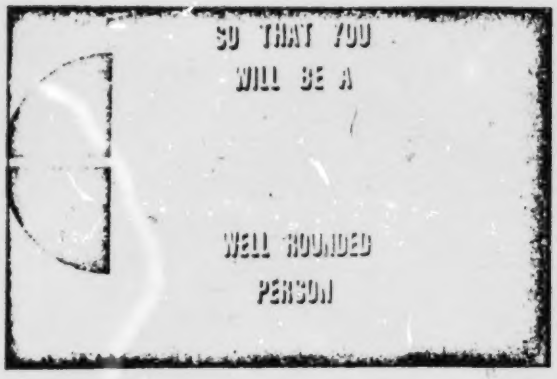
The FFA
(Future Farmers of America)
An Important National Organization
For Students In:

Agribusiness
Natural Resources
Environmental Protection



The FFA
Provides Opportunities For:

Leadership Development
Career Development
Citizenship Development
Personal Development



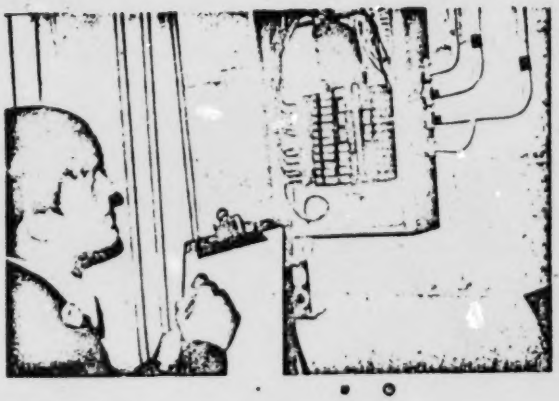
So that you will be a well rounded person, FFA can be the frosting on the cake of an exciting educational experience.

Have you watched a smoothly run meeting? It surely was guided by a set of easy rules dealing with Parliamentary Procedure. This young man is acting as a chairman and is conducting a smoothly run meeting. His gavel is his symbol of authority.

A member of the meeting rises with a question, termed "A Point of order". She is recognized and her question discussed properly. Too often private and public meetings are not conducted smoothly, causing lost time and confusion.

With the training in Parliamentary Procedure and leadership development, the student has great potential to become an effective leader.

Ever wonder what makes an electrical motor work? These young men have developed a clear and understandable demonstration of just what happens when the current is turned on. Such knowledge may help in their career development.



Career development is an important function of the FFA.

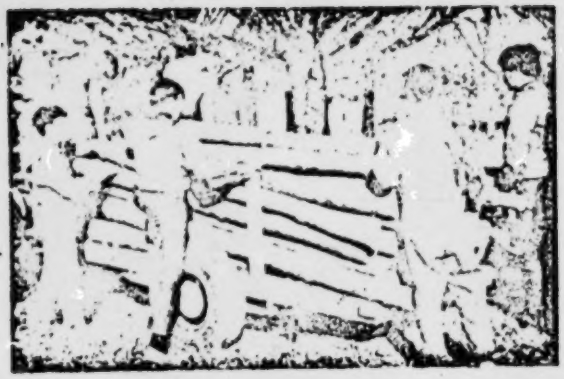
This FFA team has accepted a challenge to beat the corn yield of 304 bushels per acre. FFA members will try every legitimate practice to meet the challenge.

Tests will be made to demonstrate proper and improper methods of raising corn. The corn growth on the right is green and healthy. It has been treated with herbicides.

The difference in corn leaves is easily seen. Such knowledge gained in FFA test plots will not be forgotten in later years.

FFA members make up a Forestry Team. Their task here is to identify trees, measure their growth, and determine their lumber capacity.

Some school boards acquire land on which their FFA members may manage trees. Good management practices will guarantee wood for the future. This is citizenship development at its best.



The State Forester recommended thinning a pine plantation. This pulpwood is ready for market, with money earned for the local FFA chapter. Accurate records are kept of all group activities.

Would you like your own blueberry farm? This is a personal project for this young lady, who cares for, prunes, and picks the berries.

These blueberries are large and delicious. Profits may well pay her way to college, or enable her to expand her operation to a full time business.

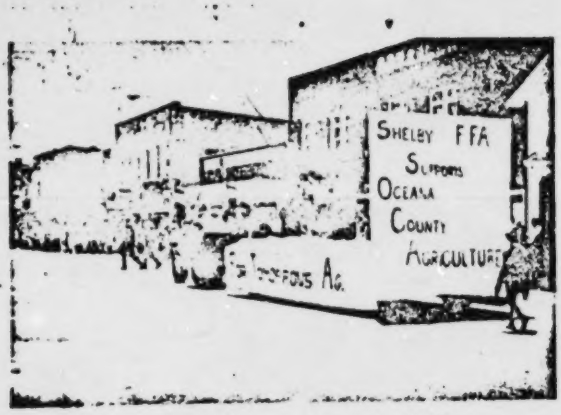
Experience in FFA projects, and Voc. Ag. training enables this young lady to expertly manage the business accounts for a pickle grading and packing plant. Deliveries go to several states.

Members proudly parade their FFA projects in a practice session before moving their animals to the nearby County Fair for show.

A year's hard work in their class project paid off in this Charolais-Angus steer when it was judged a Grand Champion. Profits from the sale of this 1,120 pound animal went to their FFA chapter.

Another FFA project is this asparagus farm. Following summer production, members inspect for rust and other diseases which might affect next year's crop.

FFA members must plan their project with great care. For working capital they often meet with banking officials or members of the school administration for support of their project.

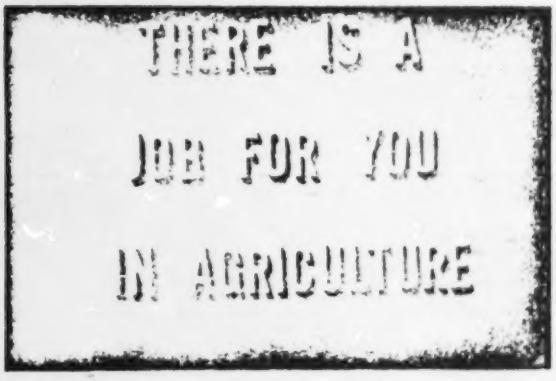


Citizenship development is an important part of FFA. These accumulations from an Earth Day clean-up project are staggering. However, the efforts have made their area a better place in which to live and the students have set a fine example for their community.

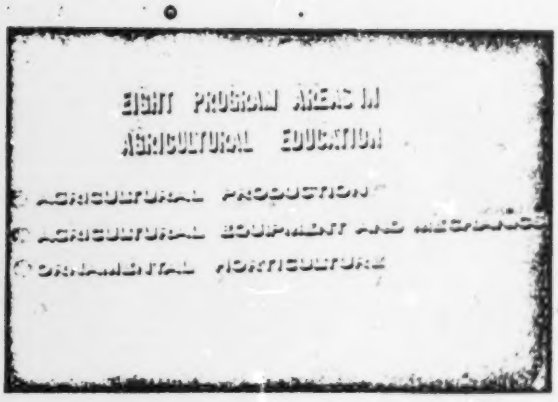
Pride in their FFA and pride in their principles is exhibited by building floats for participation in civic holiday parades.

Winning is always a pleasure. The process one must go through to win an award can be an important part of personal development.

Happily, both the public and school administrators recognize outstanding FFA members.

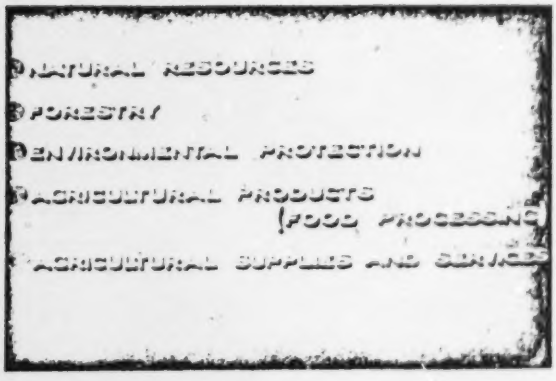


Have you recently thought about the type of work you want to do as a career? There is a job for you in agriculture. Let's look at some of the possibilities.



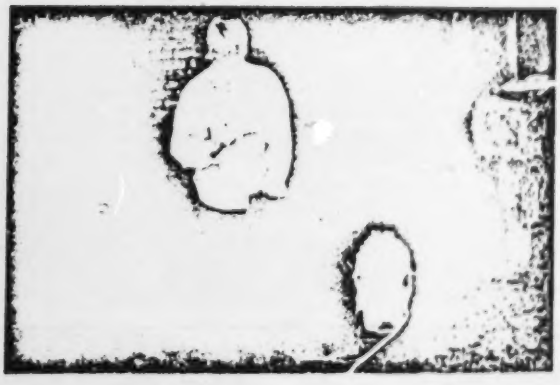
Eight Program Areas In Agricultural Education:

Agricultural Production
Agricultural Equipment and Mechanics
Ornamental Horticulture



Natural Resources
Forestry
Environmental Protection
Agricultural Products (Food Processing)
Agricultural Supplies and Services

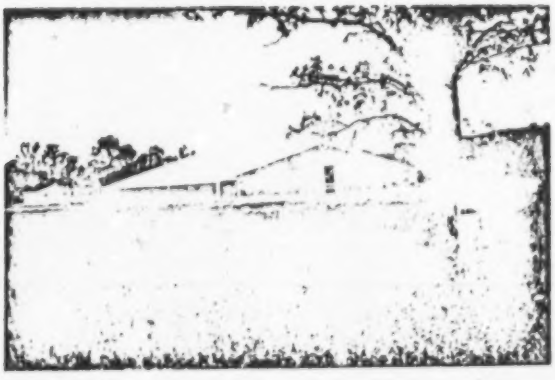
Let us now explore examples of occupations that exist in the 8 program areas.



More and more women are being graduated as Doctors of Veterinary Medicine.

It requires training, experience and a love of animals to diagnose the ailment of this calf. Some husband-wife teams are being graduated from the nation's land grant schools of veterinary medicine and practice as large and small animal doctors.

There is a continuing need for trained laboratory technicians in verterinarian medicine. Such personnel aid veterinarians in difficult diagnoses of animal patients who cannot explain their own discomforts.

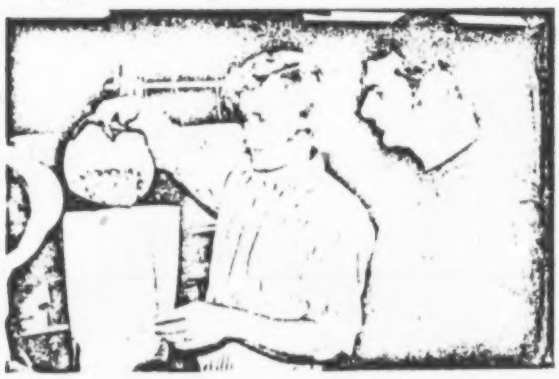


Horse training is indeed a specialized business. Providing extensive space for winter and inclement weather training is good business.

Horses are becoming more and more popular, within the reach of the average worker. Facilities to board and train horses are in increasing demand.

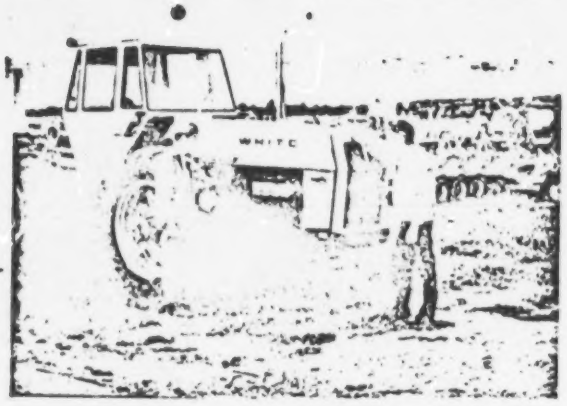
An indoor, protected arena, a spirited four year old and a skilled trainer will produce a pleasant-to-ride horse.

With the use of automatic equipment, one poultry man is capable of easily managing 25,000 hens. Eggs are picked up every other day by a major distributor and sold to the consumer.



No rural or urban area is complete without a store to supply feed, fertilizer, and seeds. Vocational agriculture can help train salespersons or managers for such a store.

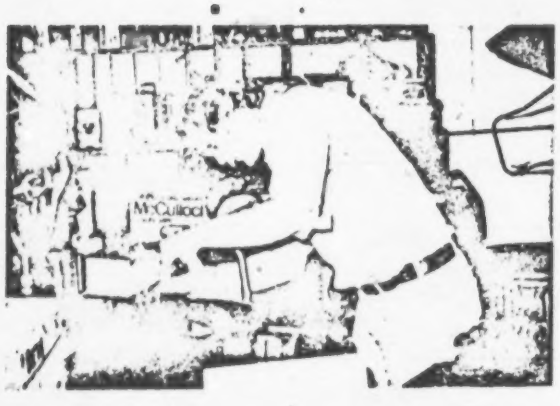
Customers depend upon wise advice from salespersons who know problems encountered by almost every kind of customer. Training in Voc. Ag. can help train a person in becoming a "Problem solver" salesperson.



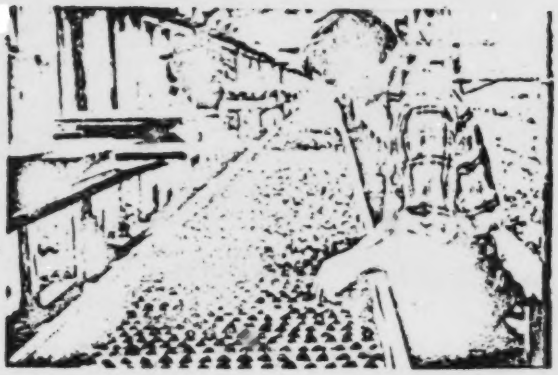
A well trained, experienced and professional agricultural equipment sales manager can advise the farmer on the appropriate equipment needed to produce large quantities of agricultural crops at the least cost.

Highly skilled welders are needed to repair agricultural machinery

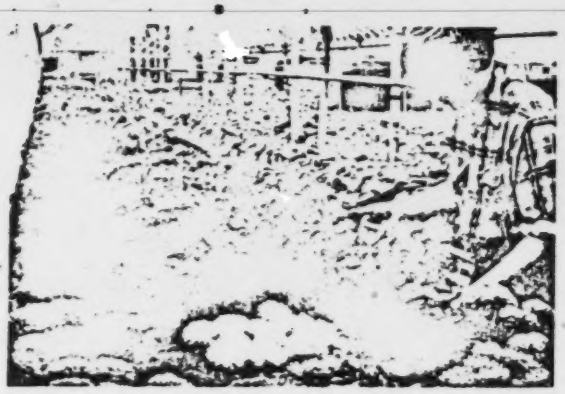
Farming and related agricultural activities depend upon trained, skilled mechanics who can repair and "keep those machines running in tip-top condition". This agricultural equipment mechanic has the ability to repair an eight row corn harvester.



Many skilled mechanics received their initial training in Voc. Ag. classes in small engine repair. The increasing popularity of chain saws, snowmobiles and trail bikes call for many well trained mechanics.



Commercial flower shops and flower lovers are dependent upon the skilled hands and technical know-how of persons who are able to propagate from cuttings. Basic horticulture is taught in Voc. Ag. courses, but critical knowledge to propagate flowers comes with experience to the florist.



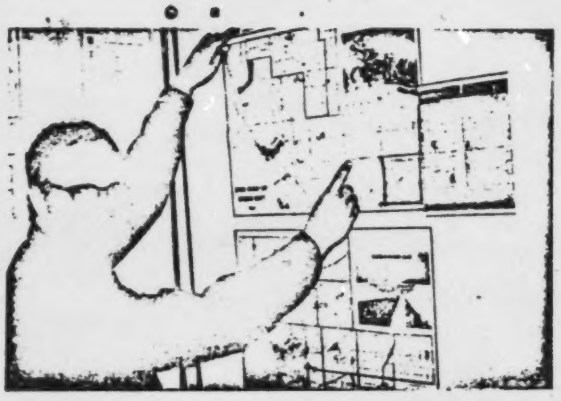
Commerical green houses supply the great demand for flowers for all occasions and florists must anticipate seasonal demands for certain varieties.

Expert advice on growing shrubs, flowers and potted plants is available from owners of shops like this one.

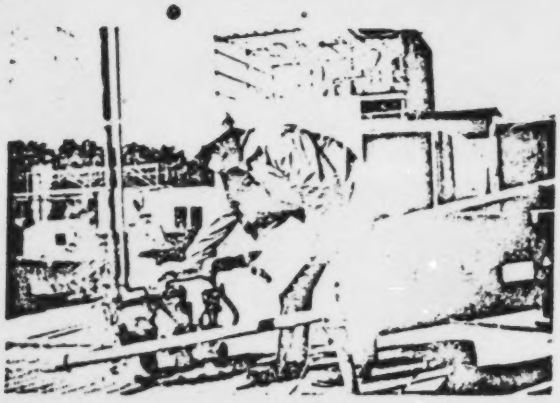
We admire the green, well kept golf courses which provide so many recreational opportunities. The reputation of such courses and their playability are the total responsibility of golf course superintendents who manage working personnel and keep their courses in tip-top condition.

Often the reputation of golf courses . . . and golfer's scores are dependent upon the quality of the grass. A turf specialist has primary responsibility for the quality of the grass. Completion of a four year course and a degree would qualify any turf specialist to work at the nation's golf courses.

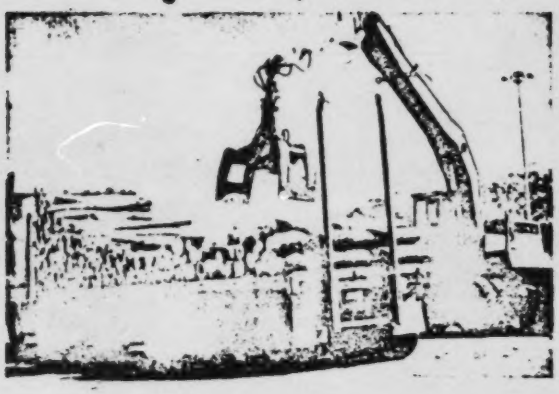
Professionally trained Game Wardens guard our hunting and fishing activities. They are the necessary guards to protect our natural heritage of field and stream and to watch for occasional infractions of state game laws. Game Wardens protect our state's environment by conserving it natural resources and providing outdoor opportunities for local citizens and visitors.



Conservationists, such as this Fire Warden, are our watch dogs for conditions which may set fire to our wonderful forests. The department for which he works has responsibility for land use planning and management, air pollution control, solid waste disposal, water shed protection, and municipal waste water treatment

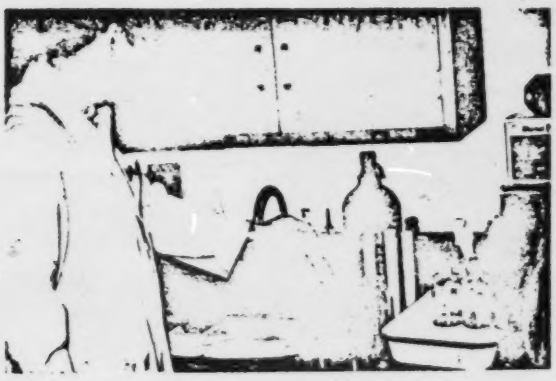


Chemical plant personnel produce, under very careful controls, the dry and liquid chemicals to help us grow more and better food products. Wherever anything grows, a hungry horde of insects and many diseases wait to attack. Entomology deals with the control of insects.

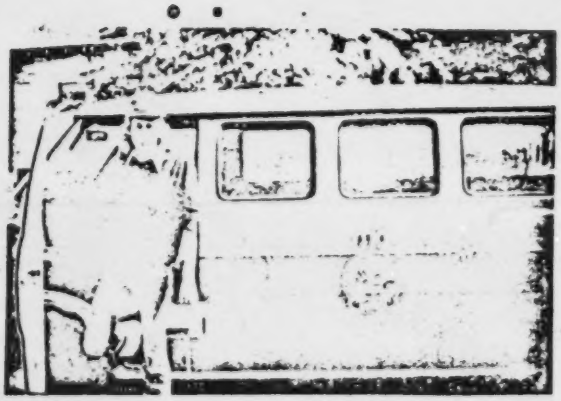


Cutting pulpwood is necessary for supplying raw materials for our nation's many papermills. Loading these logs safely requires operation by skilled equipment operators.

The unloading of pulpwood logs is mechanically performed by an operator whose delicate touch on the controls is transferred into huge steel fingers.



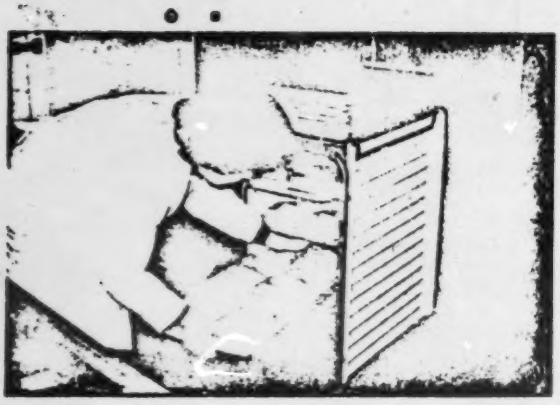
The problems of waste water disposal and treatment have been with society since civilization began. Waste water treatment laboratory technicians guard our health and insure the proper use of human and industrial wastes.



Our nation is cleaning up our environment and paying special attention to achieving and maintaining clean air. It has become a day-to-day battle against smoke, dirt, and industrial fumes that could endanger our very lives.

An air pollution specialist, atop his environmental test laboratory, takes samples of the air to measure the amount of dirt circulating in the air, and performs chemical testing for industrial fumes. Dangerous levels of polluted air could be cause for issuing an Air Alert.

Meat from modern processing plants arrives at the supermarket for preparation by the butcher in clean and cooled rooms. It must be portioned, wrapped, weighed, priced and arranged in the counter for customers.

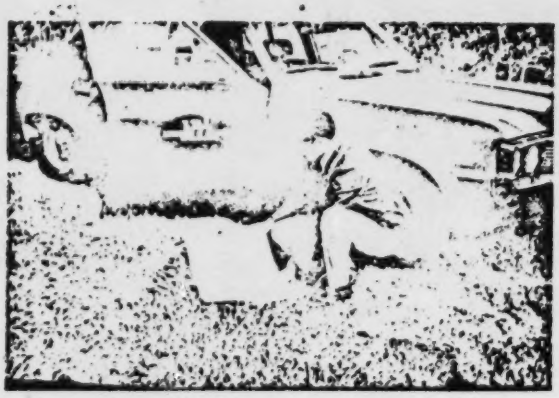


Trays of packaged meat are kept at controlled temperatures until ready for sale in display cases. Performing the responsibilities of meat preparation calls for intelligence, care and a total concern for such food products, and the store's customers.

Wherever there are lakes and streams, people who fish require fresh and lively bait. A trained bait shop specialist can provide that bait . . .

And expert advice for occasional or regular fisherman. Such bait store salespersons must be aware of local fishing conditions, state laws, and know their sporting equipment from A to Z.

Teaching vocational agriculture and serving as an advisor to an FFA chapter can be an exciting career and an opportunity for self-fulfillment. There is a national and international shortage of teachers of vocational agriculture.



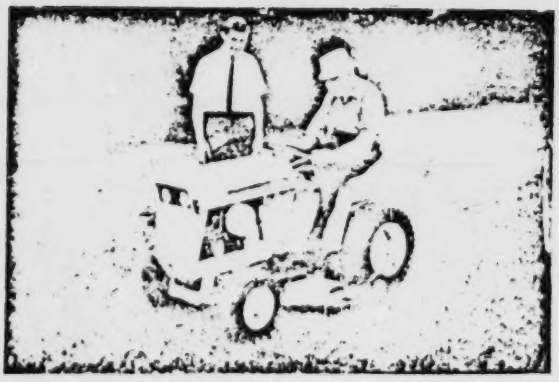
A soil conservationist is concerned with many aspects of our environment. His technical education came from a college program, but he started with an interest in agriculture in high school.

One day he may be out in the field surveying land, the next day he may be in a meeting with city officials.

As long as people fish or hunt, they will want their trophies mounted on display for reflection on how the prized one was captured. Taxidermists practice their art in recreating the animal to look as nearly lifelike as possible.

To mount a duck, in flight attitude, takes skill, artistic ability, and a thorough understanding of bird flight. The final result will almost fly . . .

The Cooperative Extension Service maintains offices throughout the United States. The County Extension Agent has a varied role to play in the community, not only working with farmers but helping people with their lawns, landscaping and gardens. The Extension Agent must have a broad agricultural background.



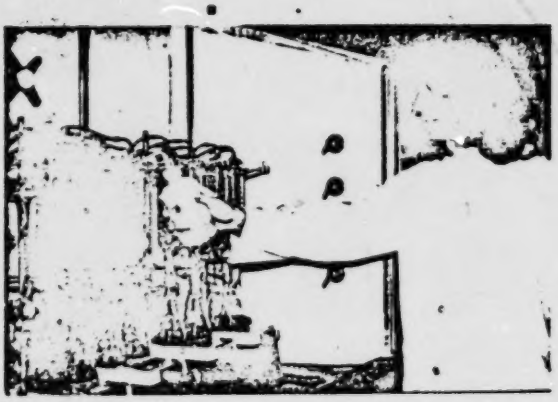
The Extension Specialist brings his speciality to an area of local need in a community

In Summary:

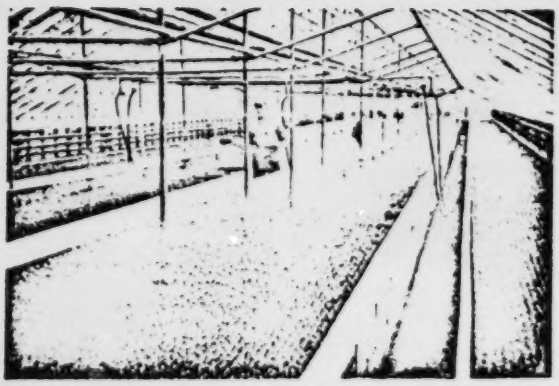
About one in four gainfully employed persons in the United States today works in some phase of the agricultural industry such as:

Agricultural Production

Supplies and Services for Agricultural Production

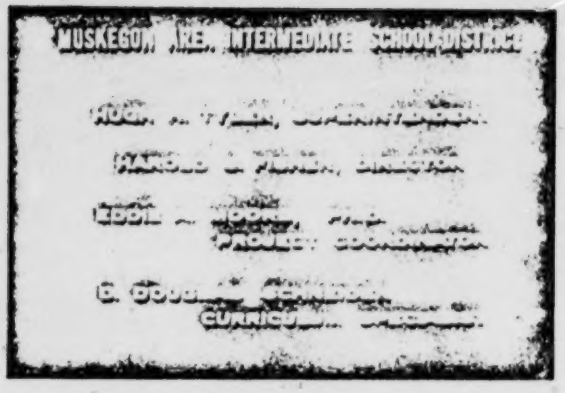


Processing and Marketing Agricultural Products

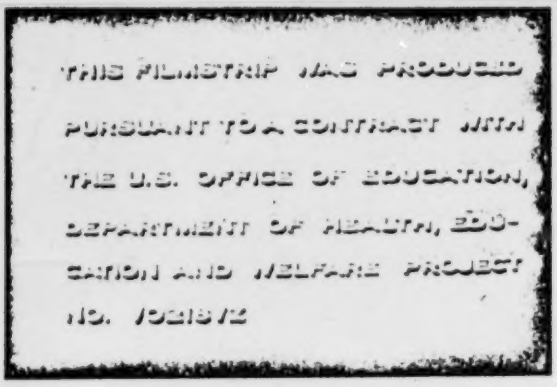


Ornamental Horticulture

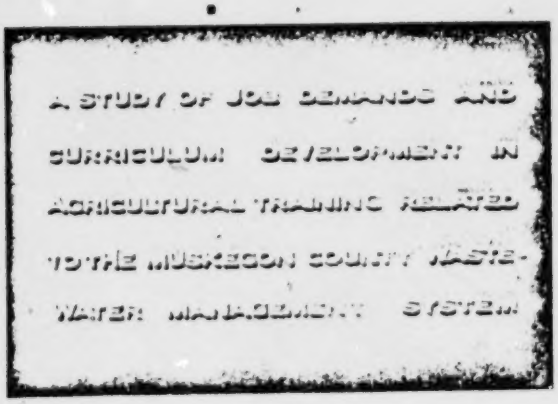
There are many jobs and positions for you to consider, in many exciting types of agricultural or agribusiness work, whether you enter such occupations directly from school, or complete a two or four year college course.



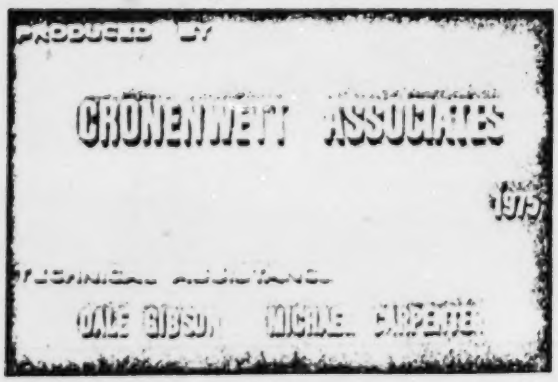
Muskegon Area Intermediate School District
Hugh H. Tyler, Superintendent
Harold S. Fisher, Director
Eddie A. Moore, Ph.D., Project Coordinator
D. Douglas Schneider, Curriculum Specialist


THIS FILMSTRIP WAS PRODUCED PURSUANT TO A CONTRACT WITH THE U.S. OFFICE OF EDUCATION, DEPARTMENT OF HEALTH, EDUCATION AND WELFARE PROJECT NO. V0218VZ

This Filmstrip was Produced Pursuant To a Contract With the U.S. Office of Education, Department of Health, Education and Welfare Project No. V0218VZ


A STUDY OF JOB DEMANDS AND CURRICULUM DEVELOPMENT IN AGRICULTURAL TRAINING RELATED TO THE MUSKEGON COUNTY WASTE-WATER MANAGEMENT SYSTEM

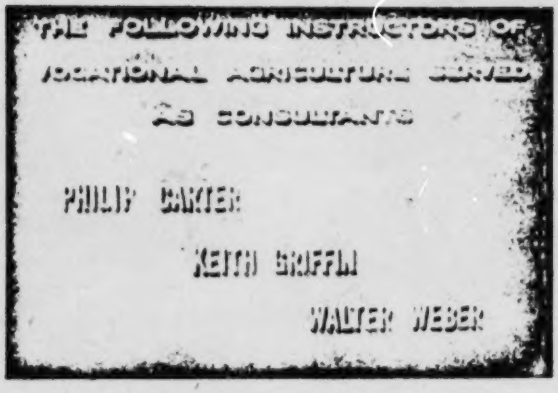
A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System



Cronenwett Associates

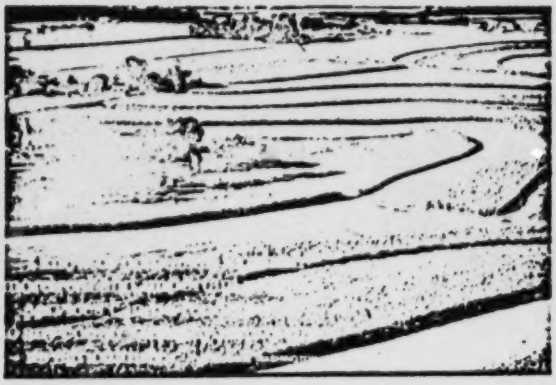
Technical Assistance

Dale Gibson
Michael Carpenter



The following instructors of Vocational Agriculture served as consultants:

Philip Carter
Keith Griffin
Walter Weber



I know of no pursuit in which more real and important service can be rendered to any country than by improving its agriculture . . .
George Washington

THE END

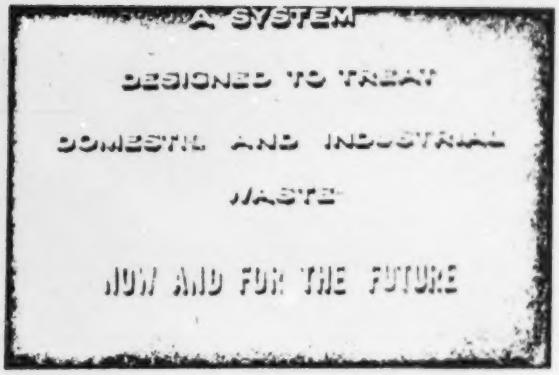
"THE MUSKEGON COUNTY WASTEWATER MANAGEMENT SYSTEM - A SYSTEM DESIGNED TO TREAT DOMESTIC AND INDUSTRIAL WASTE NOW AND FOR THE FUTURE"

Muskegon Area
Intermediate
School District

Muskegon, Michigan

Presents

The
Muskegon County
Wastewater Management
System



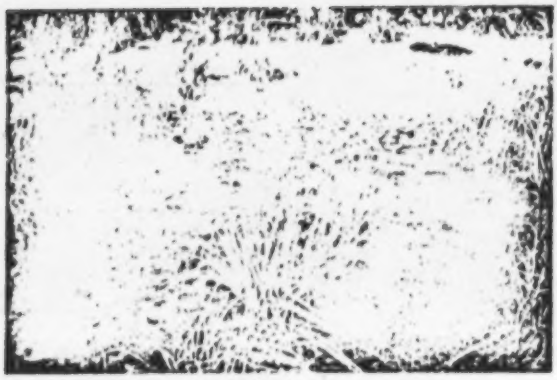
A System
Designed to Treat
Domestic and Industrical
Waste

NOW AND FOR THE FUTURE

Years ago, before the arrival of innumerable factories and many new residents, Muskegon Lake, known world-wide as the Port of Muskegon, was clean, filled with fish and was a fine body of water in which to swim.

Human and industrial wastes changed all that, until in 1969 when Muskegon County officials and environmentalists came to the realization that the area faced a real and growing tragedy unless they could solve the problem of rivers, waters and bays being poisoned by accumulating partially treated wastes.

Consulting with the University of Chicago's Center for Urban Studies, Muskegon County officials accepted a new concept in waste disposal . . the idea was to relocate all wastes to a useful place in the environment where their effect would be for total good.



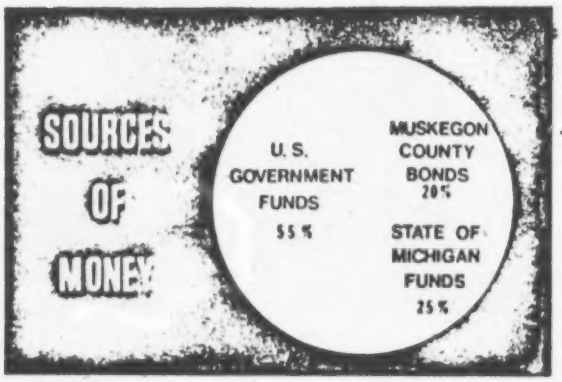
The Greater Muskegon Area was awakening to the fact that small streams were being clogged with plant growth due to nutrients from many kinds of wastes.

Water areas, formerly used for recreation and fishing, were fast becoming dirty, shallow, smelly bodies of pollution.

It was not uncommon to find chemical wastes fouling water so badly as to make them look dangerous to touch.

In capsule form: County officials, with the aid of their concerned legislators requested funds to purchase some 11,000 acres of land east of Muskegon and 300 acres north of Muskegon to begin a historic and successful operation where wastes and industrial pollutants could be used on the land as a valuable resource.

The cost of constructing the system was $42 million dollars.

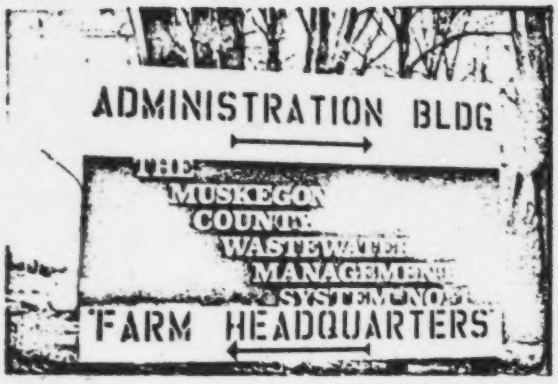


Funding came from the Federal Government, the State of Michigan and the People of Muskegon County in the percentages shown here.

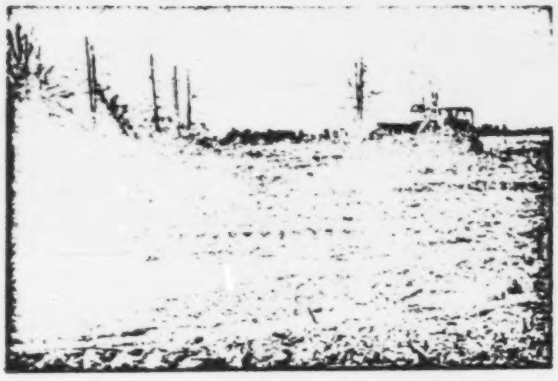
The cost included two independent sub-systems. Shown here is a view of the Whitehall-Montague area system. This filmstrip will discuss the Muskegon-Mona Lake area system in detail.

The human and industrial wastes from some 13 area municipalities and 5 major industries would be disposed on this site, safely with a planned purpose.

This new Water Pollution Control Project would eventually become the Muskegon County Wastewater Management System No. 1, the largest spray irrigation wastewater land treatment system in the world, and at the same time become Michigan's largest farm.

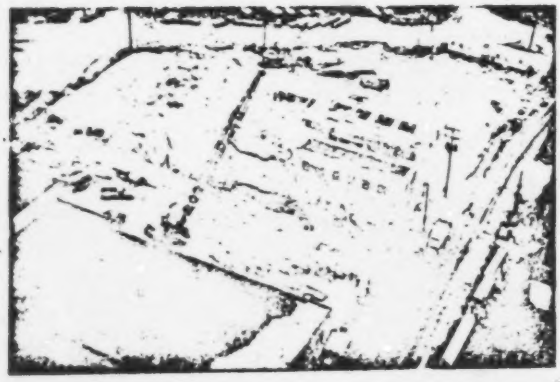


This filmstrip is about the Muskegon County Wastewater Management System No. 1.

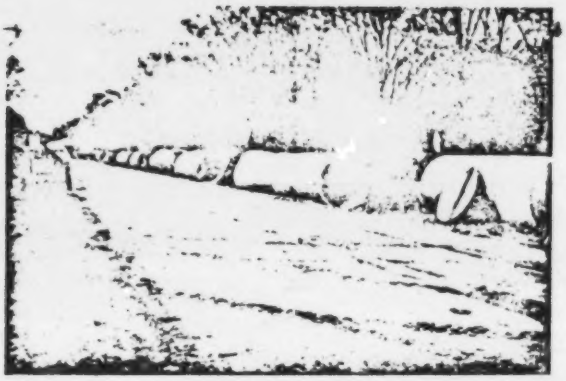


Mammoth bulldozers rip scrub growth and second generation trees from the earth, to create some 6,000 acres of tillable land, to be laid out in 54 huge circles.

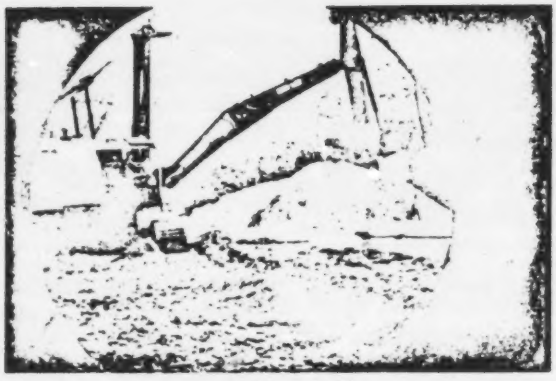
Giant earthmovers begin their task of excavating and spreading soil in a levelling process.



At the eastern end of the City of Muskegon at a point most convenient for the collecting of human and industrial wastes, construction was started on a pumping station which would move liquid wastes to the wastewater site.

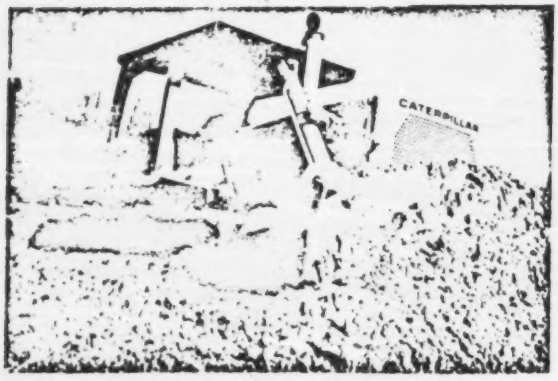


Through these huge reinforced concrete pipes, measuring 66 inches in diameter

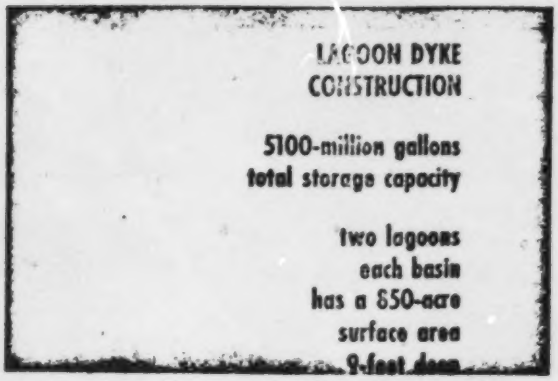


Digging in the earth and sand to bury the sewer pipe proved no great problem.

Digging an underwater trench and laying pipe did provide a challenge.

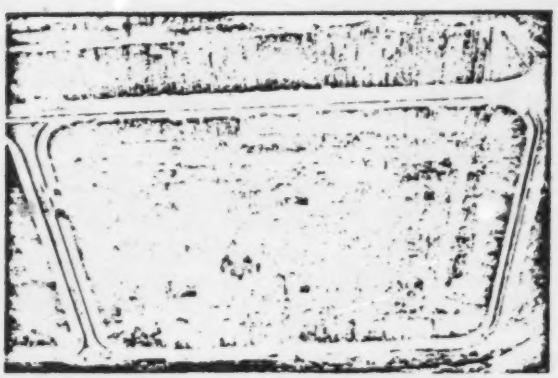


At the wastewater site, bulldozers were creating huge basins or lagoons which could store the waste products from Muskegon County residents and county industry.

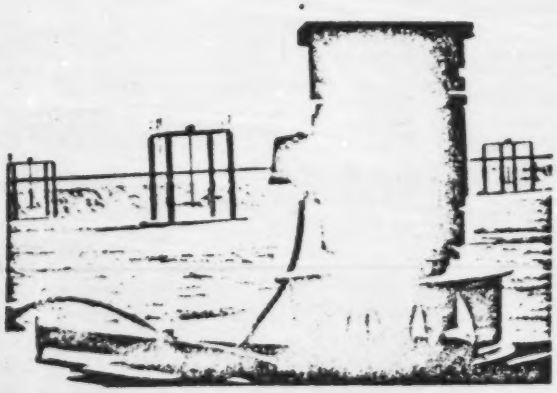


Two major lagoons were built, each 850 acres in size, to be filled to a depth of nine feet. Each lagoon would then hold 5,100 million gallons of sewage liquid.

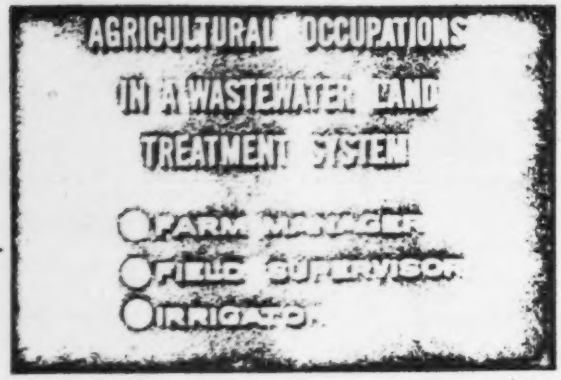
By 1973, the two major lagoons, and four adjacent smaller treatment ponds, were ready for their first use. The lagoons were soil cement lined and treated with an asphalt coating to reduce cement corrosion and erosion.



Here, the first set of six mixing units in each small lagoon, will keep the solids from settling out



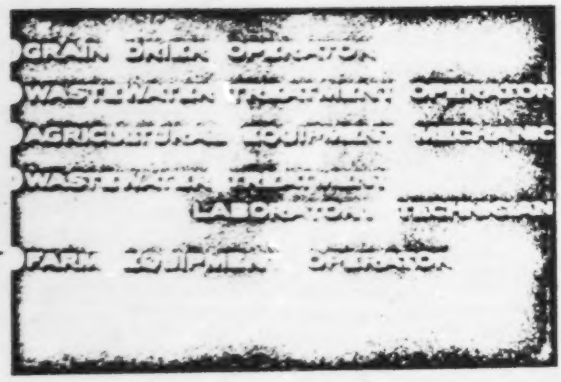
Twelve of these mechanical surface aerators will help to reduce the organic pollutants in the effluent.



Let us now examine several

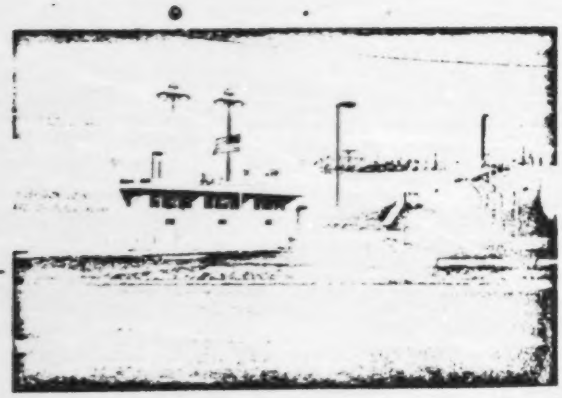
Agricultural Occupations
In A Wastewater Land
Treatment System

Farm Manager
Field Supervisor
Irrigator



Grain Drier Operator
Wastewater Treatment Operator
Agricultural Equipment Mechanic
Wastewater Treatment
Laboratory Technician
Farm Equipment Operator

What are the duties of people working in these agricultural occupations in a wastewater land treatment system?



A wastewater treatment operator works at this collecting and pumping station. The liquid waste is piped eleven miles to the first small lagoon known as an aerator.

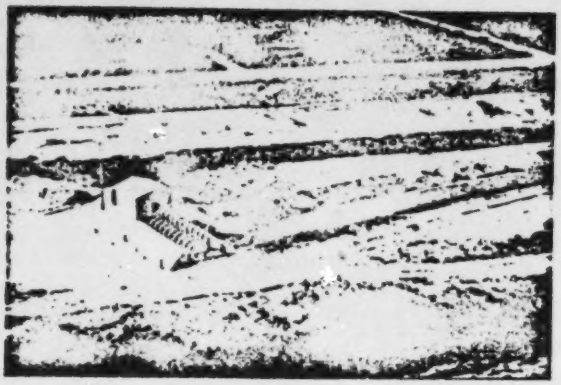
An aerator in action produces violent turbulence, mixing air and its oxygen into the liquid mixture to begin breakdown of organic pollutants.

Some, or all of the mixing units and aerators can be utilized, dependent upon the quantity of sewage being pumped from Muskegon. Effluent from these treatment cells then flows into the storage lagoons where solids settle out and the liquid remaining is stored for irrigation. One advantage of the storage basins is that they settle out the solids.

Here we see the storage lagoons.

The arrangement of the treatment cells and the storage lagoons can be seen here. Wastewater treatment operators perform the necessary tasks to operate this system.

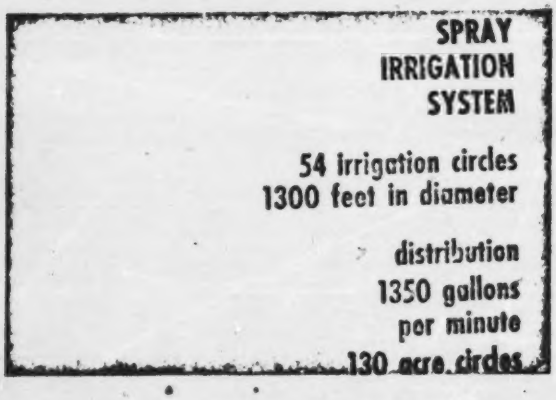
A drainage ditch around the lagoons is an added control to prevent escape of seepage. Stored effluent is chlorinated before it is sent on its way for spray irrigation. . .



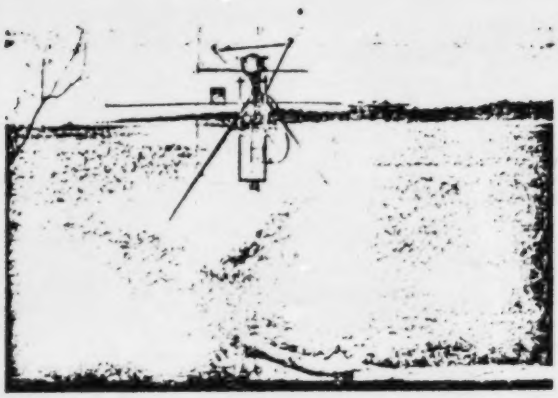
by two massive pumping stations which can handle 50 million gallons each, daily

These gigantic 250 H.P. pumps send chlorinated water through a network of pipelines to the irrigation machines. The underground pipes range from eight to 36 inches in diameter and have a total length of over 25 miles. This is where the Irrigator becomes important.

Liquid nitrogen can be added by a Farm Irrigator to one or more pumps, dependent upon the particular need of any specific area being irrigated.

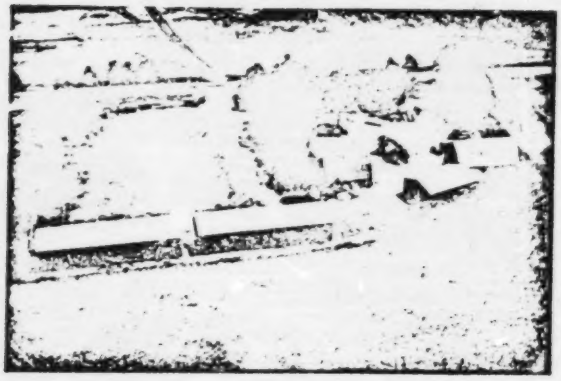


The spray irrigation system consists of 54 irrigation circles which covers an area up to 141 acres, with a distribution capability of 1,350 gallons per minute in each circle. The system is designated to spray 3.8 inches of effluent per week over an eight month application period, based upon crop nutrient requirements and a permissable rate of application.



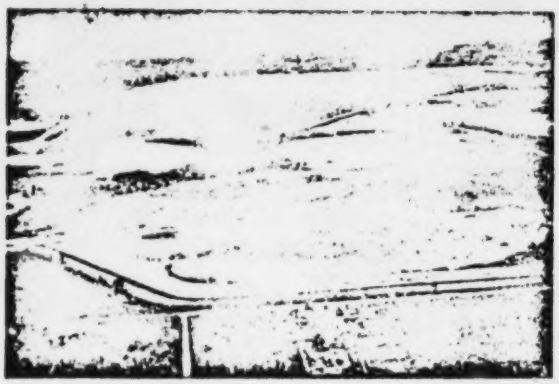
These irrigation circles become living filters with the sprayed effluent. Organic matter is decomposed by bacteria. Nutrients are taken up by plants or are held by the soil. Suspended matter and color are removed as the water percolates through the ground, and heavy metals are absorbed by organic matter and clay particles. Viruses which may be present are held long enough to be decomposed.

Spraying of treated effluent is carried on during the entire farming operations period. The period of rotation can be varied from one to five days.

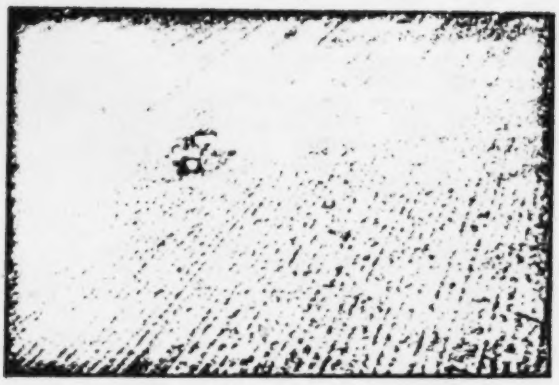


Total farming operations are located in this complex of administrative headquarters and equipment storage areas and is overseen by an Assistant Farm Manager.

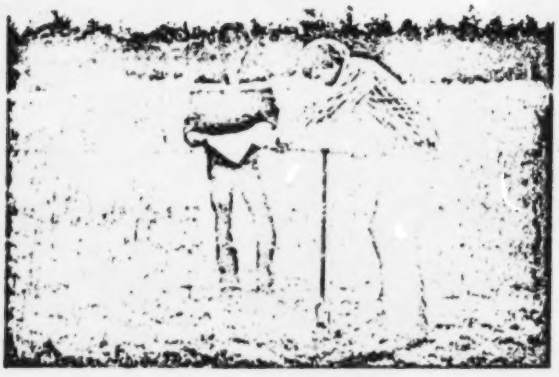
The Agricultural Equipment Mechanic keeps the equipment in up-to-date repair for safe operation and top efficiency.



As with many farm lands, the quality of the soil is not always consistent. Several types of soil may be seen in this aerial view of one circle.



Poor soil conditions can best be illustrated when corn begins to emerge.



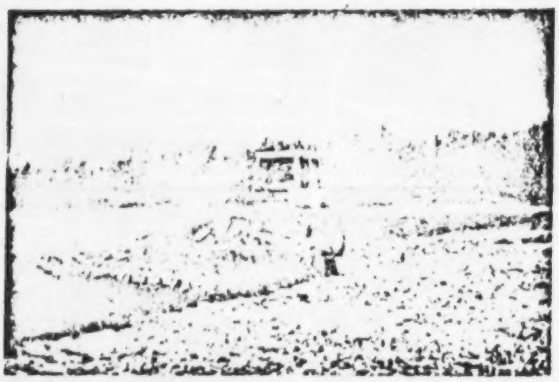
A Soils or Crop Specialist takes a controlled sample of soil.

It is carefully bagged for study and analysis in a special soil laboratory.

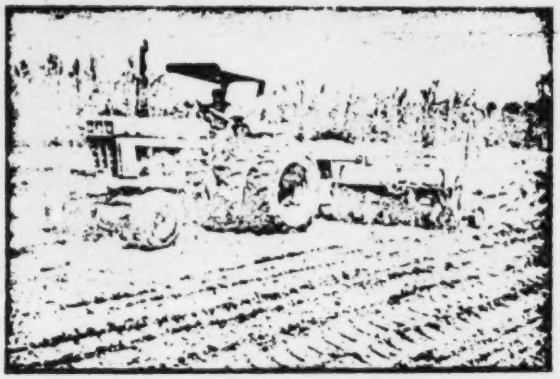
he results will determine the best steps necessary to improve soil quality. He will also test for lead, cadmium, chrome, zinc and other heavy metal deposits and analyse the amount of build-up of such metals over the years.

A library of test samples offer controlled determinations of any possible build-up of metals. In three years of site operations, such accumulation of metals has been negligible.

A laboratory scientist conducts growing tests with controlled qualities of effluent to pre-determine possible growing hazards.

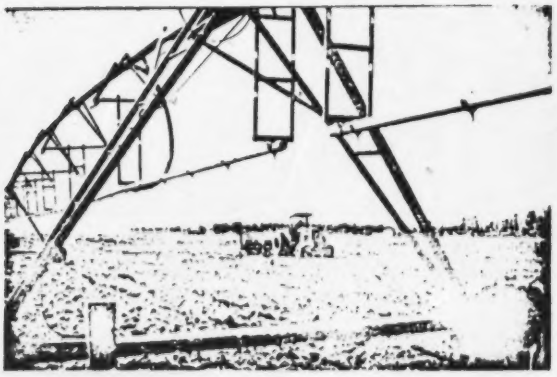


It is spring and time to plant the main crop - corn. It is time for the Farm Equipment Operator to finish ground preparation.

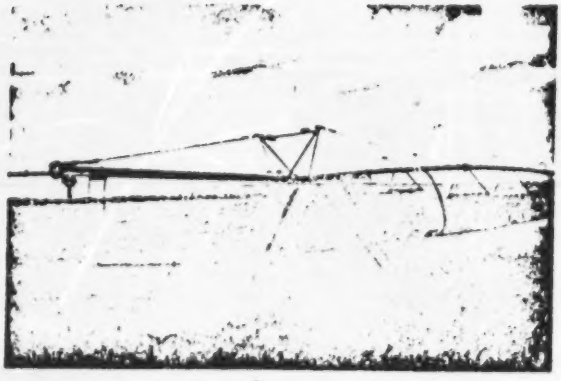


Planting activities are at their peak. The farm equipment operator drives the latest equipment which plants eight rows of corn at a time, and adds a pre-determined amount of liquid herbicide to control weed growth.

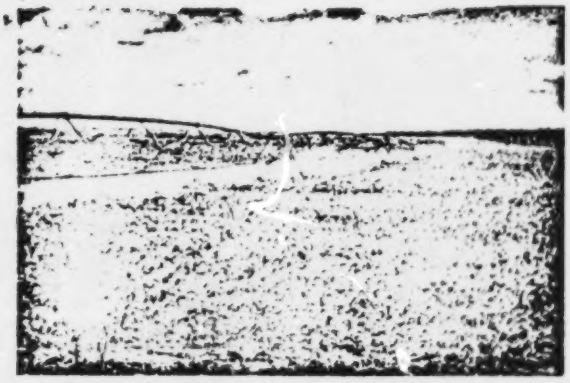
Minor adjustments or repairs may be made by a well-trained Field Supervisor. Returning equipment to farm headquarters for minor repairs would be wasting precious planting time.



After planting, an irrigation rig is ready to spray water with nutrients under low pressure downward to reduce wind blowing the water away. After percolating through the soil, water will be drawn off by a complex network of drainage, assuring that the soil will not become waterlogged or unfit for cultivation and growing.



Nature, sun and controlled irrigation soon brings a lush growth of new corn, which, when harvested, will be used for animal or poultry feed.



The spray rigs vary from 700 to 1,400 feet in length. Each of many wheels supporting the rigs are moved by electric motors. Provision has been made to control the rigs by short wave radio signals from central headquarters.

Wastewater that has helped produce this corn, after percolation through the soil, will meet and exceed all standards of the U.S. Public Health Service for drinking water quality.

The pattern of irrigated circles now take on a new look. Even now, it promises to be a good corn crop, made possible by utilizing human and industrial wastes. The employees working in this system can be proud that the corn looks so good.

A drainage ditch 60 feet wide, 23 feet deep and ten miles long, surrounds the entire growing area.

The ditch provides drainage for the living filter and it is supplemented by 35 wells, 70 miles of perforated underground drainage tile, 19 miles of main drain pipes and two pumping stations.

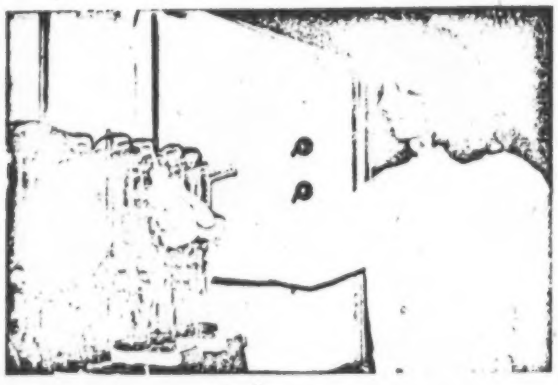
The collection from the drainage system, which has been constantly monitored, reaches an outfall, and . . .

. . . is discharged as drinkable water into the area's normal watercourses, either to Mosquito Creek or Black Creek.

From the wells surrounding the wastewater management project, a Wastewater Laboratory Technician takes daily samples from many sets of varying depth wells to critically monitor the purity. Plastic tubes are inserted into each wellpipe, and . . .

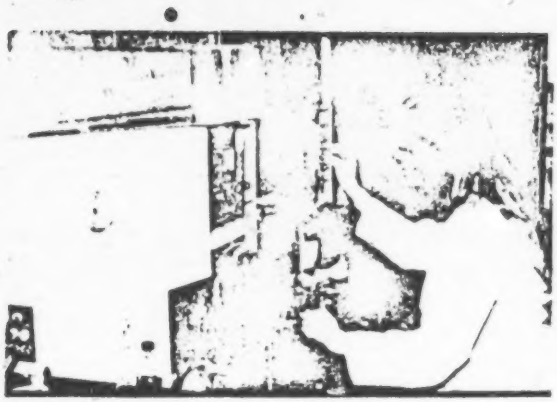
. . . after ten minutes draw-down, samples are taken in sterile bottles for laboratory analysis. Other samples from 302 observation wells around the perimeter of the irrigation site are gathered to evaluate groundwater purity at different depths.

A Wastewater Laboratory Technician makes preliminary examination of the water samples for color, then tests for conductivity, pH and turbidity.

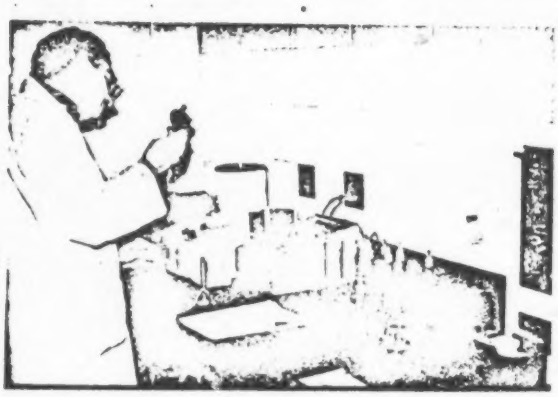


A second Laboratory Technician runs a controlled test for Chemical Oxygen Demand.

Of particular concern is the amount of bacteria which might be present in a water sample. This well-trained laboratory technician is dedicated to guarding the quality of all water being returned to the area for recreation or human use.

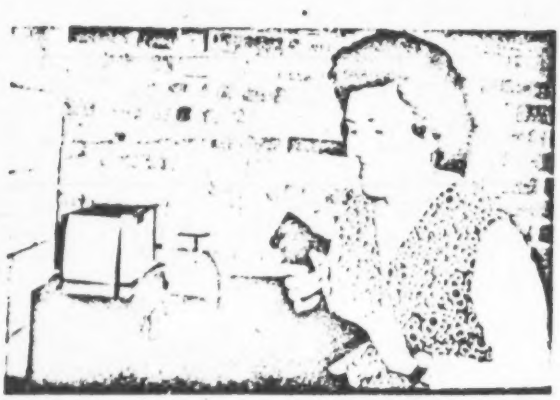


Definitive tests are carried out to determine the amount of heavy metals that might have been pumped into any one storage lagoon. special treatments can be carried out to precipitate unusual amounts of metal, or neutralize unusual chemical compounds.



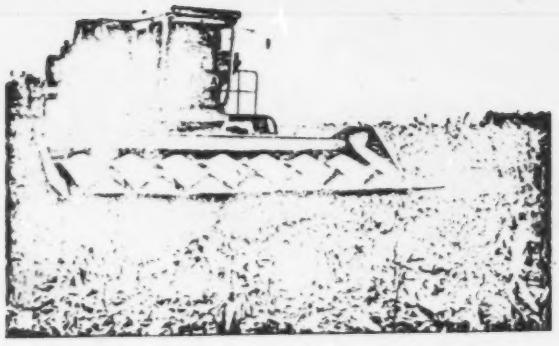
The Wastewater Laboratory Technician also performs quality tests for area industry to insure that they are meeting State of Michigan discharge levels.

A Wastewater Laboratory Technician meets state and national government requirements by keeping meticulous records on a day-to-day bsis. With the water quality under observation let us look back on the farm operation for the end results - a crop of corn.

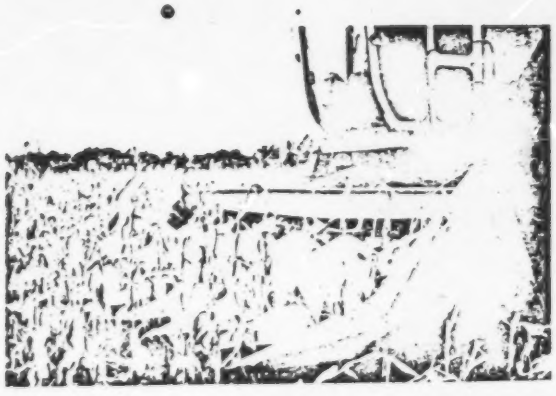


Harvest time has arrived. Daily reports and instructions go by short wave radio to the Assistant Farm Manager who. . .

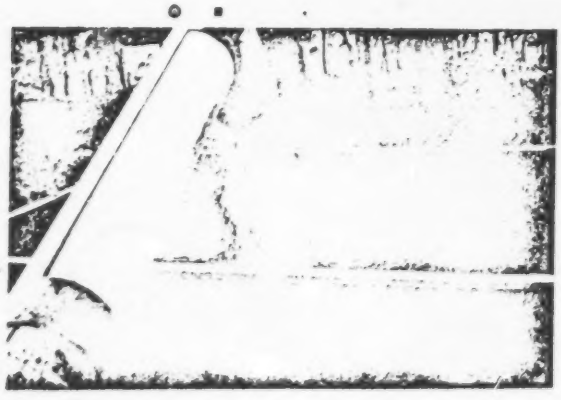
. . . must be in the field to direct the fast moving corn harvesting operation. He will also be responsible for combining the wheat and other grain crops grown at the circle intersections.



A farm equipment operator drives an eight row corn combine to another section of a field. . .

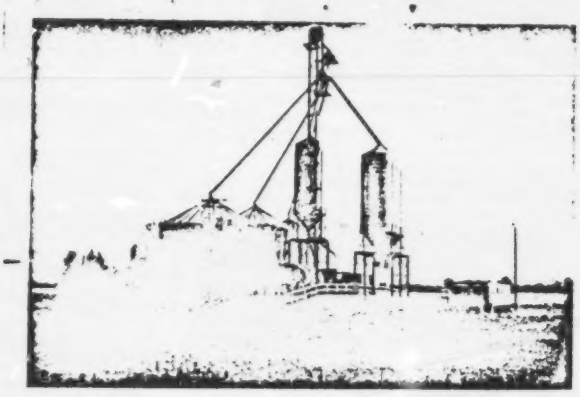


and begins a thorough job of combining eight rows of corn at a time. Leaves and cob shreds drop out the back to later mulch the soil.

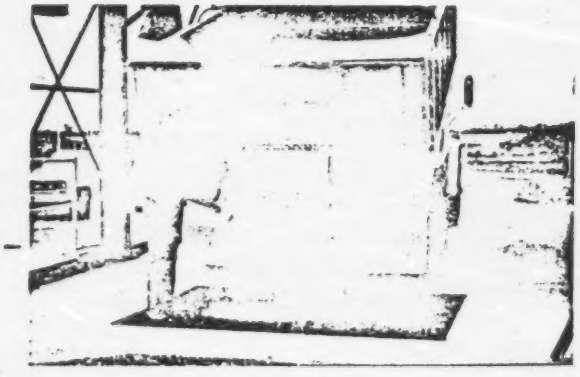


When the combine's cornbin is full, it unloads mechanically into multiple portable bins. . .

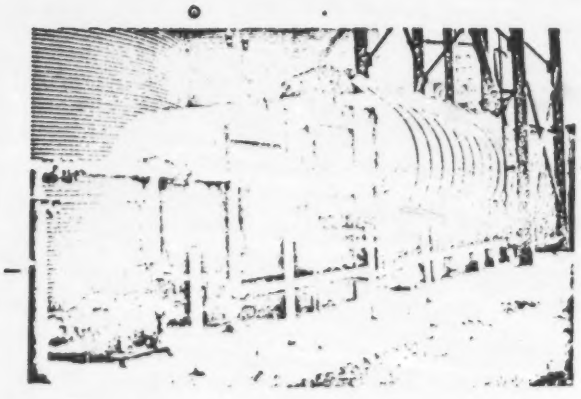
or into waiting trucks. Harvesting goes on night and day, while weather permits.



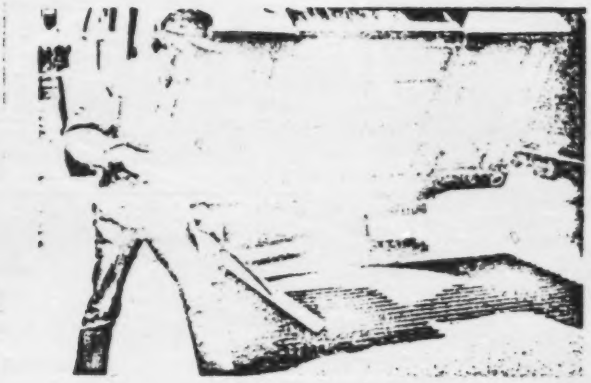
The shelled corn is transported to the Wasterwater System's own grain drying and storage facilties where the grain drier takes over.



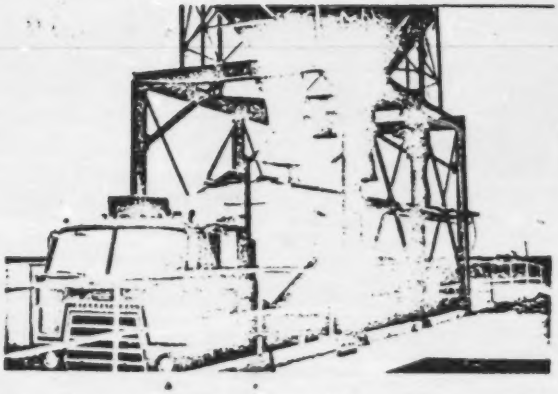
One of the grain drier operator's tasks is to take corn samples for the testing of moisture content.



Corn drops into a conveyor which hoists it high into the air, and by chutes, conveys it to an automatic corn drier which brings the corn to the required moisture content.

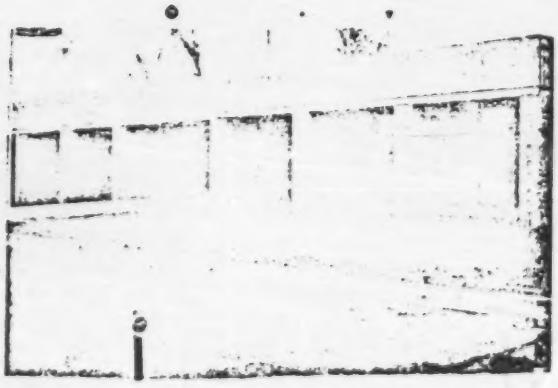


The Grain Drier Operator wastes not a kernel of this precious farm commodity.

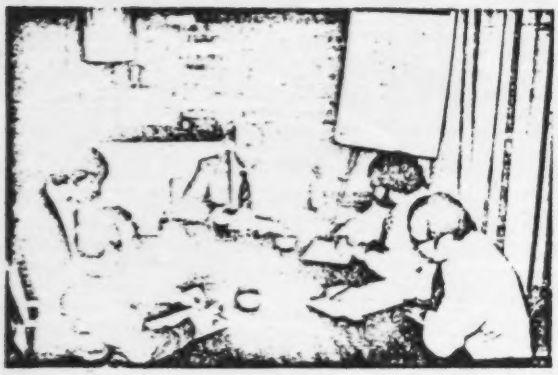


Corn from the drier is stored in circular bins, or transported for immediate delivery to customers. This truck hauls a thirty ton load of corn to a turkey farm whose Thanksgiving birds consume 15-20,000 bushels per week. It is an important duty of the Farm Manager to determine when and where to sell the corn crop.

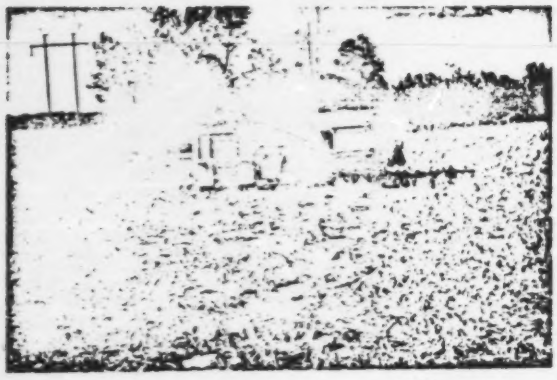
Pertinenet records are kept of every aspect of the Wastewater Management System. Income generated by farming operations will bring to Muskegon County income to reduce the cost of treating wastewater to one of the least operating cost systems in the country.



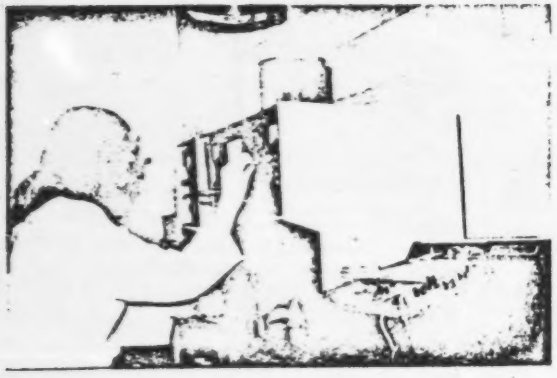
Management decisions are determined within this headquarters building. It also houses one of the two laboratories, and other support facilities.



The guiding hand for this tremendous wastewater management system is put in the hands of a Project Chief. His daily meeting with his administrative staff keeps pace with the control of a system that uses human and industrial wastes, by controlling and utilizing their potential for plant growth, and at the same time, returning filtered water of drinkable quality to enhance Muskegon County's lakes and streams -- now the cleanest they have been in a decade.



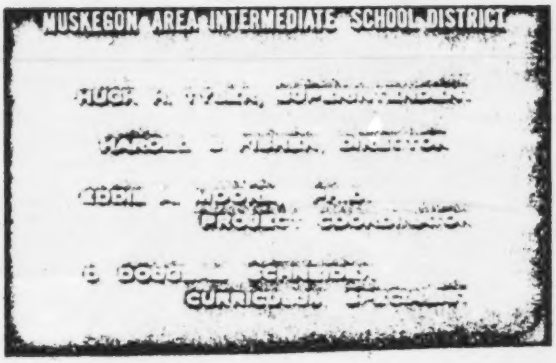
Proper credit, however, must be given to the multitude of skilled workers, whether engaged in the state's largest farming operation,



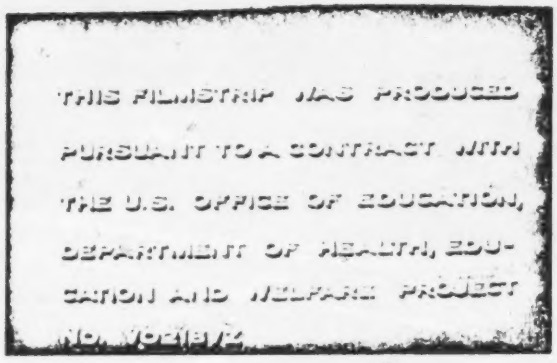
or those involved with maintaining critical control via laboratory

procedures, or operating the mechanics of the Wastewater's Management's living filter

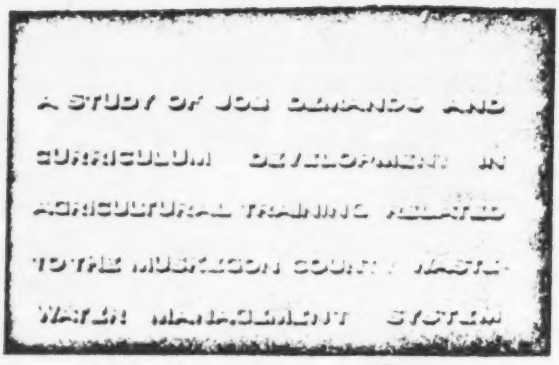
. . . these dedicated individuals combine the best scientific knowledge and skills in an agricultural oriented activity that is setting an example of true environmental control now being considered in many other areas of our nation and in the world.



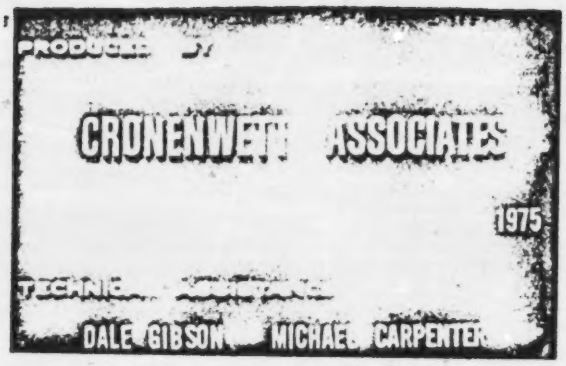
Muskegon Area Intermediate
School District
Hugh H. Tyler, Superintendent
Harold S. Fisher, Director
Eddie A. Moore, Ph. D.,
Project Coordinator
D. Douglas Schneider,
Curriculum Specialist



This Filmstrip was Produced Pursuant To A Contract with the U.S. Office of Education, Department of Health, Education and Welfare Project No. V0218VZ



A Study of Job Demands and Curriculum Development in Agricultural Training Related to the Muskegon County Wastewater Management System



Cronenwett Associates

Technical Assistance

Dale Gibson
Michael Carpenter

THE END

APPENDIX A

A LIST OF INDIVIDUALS WHO PROVIDED ASSISTANCE IN DEVELOPING THE TWO FILMSTRIPS AND CASSETTE TAPES

Name	Position, Address
Mr. Morse Brown	District Conservationist U.S. Soil Conservation Service Muskegon, Michigan
Mr. Michael Carpenter	Graphic Specialist Muskegon Area Intermediate School District Muskegon, Michigan
Mr. Philip Carter	Instructor of Vocational Agriculture Shelby, Michigan
Mr. Wilson R. Cronenwett	President Cronenwett Associates Holton, Michigan
Dr. Yervant Ara Demirjian	Director of the Muskegon County Wastewater Management System Muskegon, Michigan
Mr. Harold Ferris	Director of the Muskegon County Agricultural Extension Service Muskegon, Michigan
Mr. Dale E. Gibson	Instructional Services Director Muskegon Area Intermediate School District Muskegon, Michigan
Mr. Keith Griffin	Instructor of Vocational Agriculture Montague, Michigan
Mr. Casey Groenveld	Communications Consultant Communication & Training Services Muskegon, Michigan
Mr. Walter Weber	Instructor of Vocational Agriculture Ravenna, Michigan

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